
Final Fishery Management Plan

For

Atlantic Tuna,

Swordfish,

and Sharks

April 1999

Including
the Revised Final Environmental Impact Statement,
the Final Regulatory Impact Review,
the Final Regulatory Flexibility Analysis,
and the Final Social Impact Assessment

Prepared by the
Highly Migratory Species Management Division,
Office of Sustainable Fisheries,
National Marine Fisheries Service
Silver Spring, Maryland

TABLE OF CONTENTS

VOLUME 1

Executive Summary

Chapter 1: Introduction

- 1.1 Purpose and Need
 - 1.1.1 The HMS Process and History
 - 1.1.2 Issues/Problems for Resolution
 - 1.1.3 Domestic Considerations
 - 1.1.4 International Considerations
 - 1.1.5 Objectives
- 1.2 Conservation and Management Measures
- 1.3 Management Units
- 1.4 Scientific Data and Research Needs
- 1.5 Development of Fishery Resources
- 1.6 Total Allowable Level of Foreign Fishing
- 1.7 Relationship to International Agreements, Applicable Laws, and Other Fishery Management Plans
 - 1.7.1 ICCAT and its relationship to ATCA and the Magnuson-Stevens Act
 - 1.7.2 The United Nations Agreement on Straddling Fish Stocks and HMS
 - 1.7.3 Other Fishery Management Plans
 - 1.7.4 Relationship of this FMP to Existing HMS Management Measures
 - 1.7.5 Paperwork Reduction Act
 - 1.7.6 Coastal Zone Management
 - 1.7.7 Endangered Species Act
 - 1.7.8 Marine Mammal Protection Act
 - 1.7.9 Federalism
 - 1.7.10 Executive Order 12866 (E.O. 12866)
- 1.8 What's in the HMS FMP
- 1.9 Relationship of the HMS FMP to the Magnuson-Stevens Act Requirements
- 1.10 List of Preparers
- 1.11 List of Agencies and Organizations Consulted

Chapter 2: Description of HMS Fisheries

- 2.1 An Introduction to HMS Quotas, Total Allowable Catches, and Discards
- 2.2 Atlantic Tunas
 - 2.2.1 Life History and Status of the Stocks: Atlantic Tunas
 - 2.2.2 International Aspects of the Atlantic Tuna Fishery
 - 2.2.3 Domestic Aspects of the Atlantic Tuna Fishery
 - 2.2.4 Social and Economic Aspects of the Domestic Atlantic Tuna Fishery
 - 2.2.4.1 Bluefin Tuna
 - 2.2.4.2 BAYS Tunas
- 2.3 Atlantic Swordfish
 - 2.3.1 Life History and Status of the Stocks
 - 2.3.2 International Aspects of the Atlantic Swordfish Fishery
 - 2.3.3 Domestic Aspects of the Atlantic Swordfish Fishery
 - 2.3.4 Social and Economic Aspects of the Domestic Atlantic Swordfish Fishery

- 2.4 Atlantic Sharks
 - 2.4.1 Life History and Status of the Stocks
 - 2.4.1.1 Status of the Stocks
 - 2.4.1.2 Status of the Stocks - Small Coastal Sharks
 - 2.4.1.3 Status of the Stocks - Pelagic Sharks
 - 2.4.2 International Aspects of the Atlantic Shark Fisheries
 - 2.4.3 Domestic Aspects of the Atlantic Shark Fisheries
 - 2.4.4 Social and Economic Aspects of the Domestic Atlantic Shark Fisheries
- 2.5 HMS Gear Types
 - 2.5.1 Pelagic Longlines
 - 2.5.2 Bottom Longlines
 - 2.5.3 Atlantic Pelagic Driftnets
 - 2.5.4 Atlantic Coastal Driftnets
 - 2.5.5 Southeast Shark Drift Gillnets
 - 2.5.6 Sink Gillnets
 - 2.5.7 Purse Seines
 - 2.5.8 Handgear (Rod and Reel, Handline and Harpoon)
- 2.6 Current Permitting, Reporting, Data Collection Requirements and Fisheries Monitoring
 - 2.6.1 Monitoring and Reporting in the Commercial Fishery
 - 2.6.2 Monitoring and Reporting in the Recreational Fishery
 - 2.6.3 Other Data Collection Programs
- 2.7 Existing Time/Area Closures under MMPA and Other Laws

Chapter 3: Rebuilding and Maintaining HMS Fisheries

- 3.1 Management Under National Standard 1: The Maximum Sustainable Yield Control Rule
 - 3.1.1 The Maximum Fishing Mortality Threshold
 - 3.1.2 The Minimum Stock Size Threshold
- 3.2 Overfished Stocks: Managing for Recovery
 - 3.2.1 Biomass Target During Rebuilding
 - 3.2.2 Recovery Period: The Rebuilding Trajectory
 - 3.2.3 Target Control Rule During Rebuilding
- 3.3 Healthy Stocks: Managing for F_{OY}
 - 3.3.1 Target Control Rule for Healthy Stocks
 - 3.3.2 Biomass Approaching Overfished Designation: the Minimum Biomass Flag
- 3.4 Management Measures for Directed Fishing
 - 3.4.1 Quota Alternatives
 - 3.4.1.1 Atlantic Tunas
 - 3.4.1.1.1 Bluefin Tuna Quota Alternatives
 - 3.4.1.1.2 Bluefin Tuna Domestic Allocation
 - 3.4.1.1.3 Bluefin Tuna Quota Transfer Criteria
 - 3.4.1.1.4 Bigeye Tuna Quota Alternatives
 - 3.4.1.2 North Atlantic Swordfish
 - 3.4.1.2.1 North Atlantic Swordfish Quota Alternatives
 - 3.4.1.2.2 Swordfish Domestic Allocation
 - 3.4.1.3 Atlantic Sharks
 - 3.4.1.3.1 Commercial Quota Alternatives for Large Coastal Sharks
 - 3.4.1.3.2 Pelagic Sharks Commercial Quota Alternatives
 - 3.4.1.3.3 Small Coastal Sharks Commercial Quota Alternatives
 - 3.4.1.3.4 Fishery Operations
 - 3.4.1.3.5 Overharvest/Underharvest Adjustments
 - 3.4.1.3.6 Public Display and Scientific Quota

- 3.4.2 Effort Controls, Retention Limits, and Other Management Measures
 - 3.4.2.1 Atlantic Tunas
 - 3.4.2.1.1 Bluefin Tuna Effort Controls
 - 3.4.2.1.2 Bluefin Tuna Recreational Retention Limits
 - 3.4.2.1.3 Bluefin Tuna Size Limits
 - 3.4.2.1.4 Yellowfin Tuna Size Limits
 - 3.4.2.1.5 Yellowfin Tuna Recreational Retention Limits
 - 3.4.2.1.6 Bigeye Tuna Size Limits
 - 3.4.2.2 North Atlantic - Swordfish Rebuilding
 - 3.4.2.2.1 Swordfish Size Limits
 - 3.4.2.2.2 Swordfish Retention Limits
 - 3.4.2.3 Atlantic Sharks
 - 3.4.2.3.1 Prohibited Species
 - 3.4.2.3.2 Shark Recreational Retention and Size Limits
 - 3.4.2.3.3 Recreational Landing Condition for Sharks
 - 3.4.2.3.4 Prohibition on Finning of Sharks
 - 3.4.2.3.5 Directed Large Coastal Shark Commercial Retention Limit
- 3.4.3 Authorized Gears
 - 3.4.3.1 Atlantic Tunas
- 3.4.4 Fishing Year
- 3.5 A Strategy for Bycatch Reduction in HMS Fisheries
 - 3.5.1 Introduction
 - 3.5.1.1 Bycatch Reduction and The Magnuson-Stevens Act
 - 3.5.1.2 Bycatch Reduction and the Marine Mammal Protection Act
 - 3.5.1.3 Bycatch Reduction and the Endangered Species Act
 - 3.5.2 Evaluation and Monitoring of Bycatch
 - 3.5.2.1 Bycatch of HMS in All Fisheries
 - 3.5.2.2 Finfish Bycatch in HMS Fisheries
 - 3.5.2.3 Marine Mammal Bycatch in HMS Fisheries
 - 3.5.2.4 Sea Turtle Bycatch in HMS Fisheries
 - 3.5.2.5 Sea Bird Bycatch in HMS Fisheries
 - 3.5.2.6 Summary of Bycatch Issues
 - 3.5.3 Management Measures to Address Bycatch Problems
 - 3.5.4.1 Reducing HMS Bycatch and Bycatch Mortality
 - 3.5.4.1.1 Bluefin Tuna
 - 3.5.4.1.2 Swordfish Bycatch Reduction Measures
 - 3.5.4.1.3 Sharks
 - 3.5.4.1.4 Billfish
 - 3.5.4.1.5 General Bycatch Reduction Measures
 - 3.5.4.2 Reducing Protected Species Bycatch and Bycatch Mortality
 - 3.5.4 A Strategy for Future Bycatch Reduction
- 3.6 Interim Milestones (During Recovery)
- 3.7 Uncertainty Issues
- 3.8 Monitoring, Permitting and Reporting
 - 3.8.1 Introduction
 - 3.8.2 Monitoring, Permitting and Reporting Measures
- 3.9 Safety of Human Life At Sea
 - 3.9.1 Fishery Access and Weather-Related Vessel Safety
 - 3.9.2 Procedures for Consideration of Management Adjustments
 - 3.9.3 Other Safety Issues
- 3.10 Ongoing Management
 - 3.10.1 An Introduction to FMP amendments and Frameworks
 - 3.10.2 Stock Assessment and Fishery Evaluation Report
 - 3.10.3 Advisory Panel and Continuing Fishery Management
 - 3.10.4 Procedure for Adjusting the Management Measures

3.10.5 Shark Operations Team

Chapter 4: Limited Access

- 4.1 Background
- 4.2 Purpose and Need for Action
- 4.3 Limitations on Access
- 4.4 Limitations on Number of Permitted Vessels
- 4.5 Initial Permit Issuance
 - 4.5.1 Permit Eligibility Period - Historic
 - 4.5.2 Landings Eligibility Period
 - 4.5.3 Permit Eligibility Period - Recent
 - 4.5.4 Directed Landings Thresholds
 - 4.5.5 Incidental Landings Threshold
 - 4.5.6 Swordfish Handgear
 - 4.5.7 BAYS Tuna Fishery
 - 4.5.8 Appeals
 - 4.5.8.1 Process
 - 4.5.8.2 Hardship
 - 4.5.9 Exemptions
- 4.6 Harvest Limits
 - 4.6.1 Limits for Swordfish Directed Permit Holders During Directed Fishery Closures
 - 4.6.2 Limits for Incidental Limited Access Permit Holders
- 4.7 Transferability of Permits
 - 4.7.1 Transferability Restrictions
 - 4.7.2 Upgrading Restrictions
 - 4.7.3 Ownership Restrictions
- 4.8 Environmental Consequences
 - 4.8.1 Number of Permit Categories
 - 4.8.2 Limits the Number of Vessels Permitted
 - 4.8.3 Eligibility to Participate in the Directed and Incidental Fisheries
 - 4.8.4 Appeals Process
 - 4.8.5 Transferability Restrictions
 - 4.8.6 Upgrading Restrictions
 - 4.8.7 Ownership Restrictions
 - 4.8.8 Harvest Limits
 - 4.8.9 Impacts on Marine Mammal and Endangered Species
 - 4.8.10 Mitigating Measures
 - 4.8.11 Unavoidable Adverse Impacts
 - 4.8.12 Irreversible and Irretrievable Commitment of Resources

VOLUME II

Chapter 5: HMS Habitat Provisions

- 5.1 Introduction
- 5.2 Regulatory Requirements
 - 5.2.1 Description and Identification of EFH
 - 5.2.2 Fishing Activities That May Adversely Affect EFH
 - 5.2.3 Non-Fishing Activities That May Adversely Affect EFH and Respective Conservation Measures
 - 5.2.4 Cumulative Impacts Analysis
 - 5.2.5 Habitat Areas of Particular Concern
 - 5.2.6 Research and Information Needs

- 5.3 Habitat Goals
- 5.4 HMS Habitat Types and Distributions
 - 5.4.1 Atlantic
 - 5.4.2 Gulf of Mexico
 - 5.4.3 U.S. Caribbean

Chapter 6: HMS Essential Fish Habitat Provisions

- 6.1 Introduction
- 6.2 EFH Identification Processes
 - 6.2.1 Process Used for Identification of EFH for Tuna and Swordfish
 - 6.2.2 Process Used for Identification of EFH for Atlantic Sharks
 - 6.2.3 Methodology for Identification of EFH for HMS
- 6.3 Life History Accounts and Essential Fish Habitat Descriptions
 - 6.3.1 Tuna
 - 6.3.1.1 Atlantic Albacore (*Thunnus alalunga*)
 - 6.3.1.2 Atlantic Bigeye Tuna (*Thunnus obesus*)
 - 6.3.1.3 Atlantic Bluefin Tuna (*Thunnus thynnus*)
 - 6.3.1.4 Atlantic Skipjack Tuna (*Katsuwonus pelamis*)
 - 6.3.1.5 Atlantic Yellowfin Tuna (*Thunnus albacares*)
 - 6.3.2 Swordfish (*Xiphias gladius*)
 - 6.3.3 Large Coastal Sharks
 - 6.3.3.1 Basking Sharks
 - 6.3.3.2 Hammerhead Sharks
 - 6.3.3.3 Mackerel Sharks
 - 6.3.3.4 Nurse Sharks
 - 6.3.3.5 Requiem Sharks
 - 6.3.3.6 Sand Tiger Sharks
 - 6.3.3.7 Whale Sharks
 - 6.3.4 Small Coastal Sharks
 - 6.3.4.1 Angel Sharks
 - 6.3.4.2 Hammerhead Sharks
 - 6.3.4.3 Requiem Sharks
 - 6.3.5 Pelagic Sharks
 - 6.3.5.1 Cow sharks
 - 6.3.5.2 Mackerel Sharks
 - 6.3.5.3 Requiem Sharks
 - 6.3.5.4 Thresher Sharks
- 6.4 Summary Tables of Life History and Habitat Associations
- 6.5 Essential Fish Habitat Maps (by species and life stage)
- 6.6 Threats to Essential Fish Habitat
 - 6.6.1 Fishing Activities That May Adversely Affect EFH
 - 6.6.2 Non-fishing Threats to EFH
 - 6.6.2.1 Marine Sand and Minerals Mining
 - 6.6.2.2 Offshore Oil and Gas Operations
 - 6.6.2.3 Coastal Development
 - 6.6.2.4 Dredging and Disposal of Dredge Material
 - 6.6.2.5 Agriculture (and Silviculture)
 - 6.6.2.6 Aquaculture and Mariculture
 - 6.6.2.7 Navigation
 - 6.6.2.8 Marinas and Recreational Boating
 - 6.6.2.9 Ocean Dumping
 - 6.6.3 Cumulative Impacts

- 6.7 Research and Information Needs
 - 6.7.1 Tuna and swordfish
 - 6.7.2 Sharks
- 6.8 Review and Revision of FMP EFH Components

VOLUME III

Chapter 7: Final Regulatory Impact Review and Final Regulatory Flexibility Analysis

- 7.1 Background
 - 7.1.1 Net Economic Benefit
 - 7.1.2 Economic Impact
 - 7.1.3 Common Misconceptions
 - 7.1.4 Present Value Analyses
 - 7.1.5 RIR versus RFA
- 7.2 The Need for Action
- 7.3 Objectives of the FMP
- 7.4 Description of the Compliance and Reporting Requirements
- 7.5 Relevant Federal Rules which May Conflict with the Final Actions
- 7.6 Final Regulatory Impact Review
 - 7.6.1 Economic Impacts of the Bluefin Tuna Rebuilding Alternatives
 - 7.6.1.1 Estimated Commercial Gross Revenues
 - 7.6.1.2 Estimated Commercial Net Revenues
 - 7.6.1.3 Estimated Angler Consumer Surplus
 - 7.6.2 Economic Impacts of the Alternatives to Minimize Bluefin Tuna Dead Discards
 - 7.6.3 Economic Impacts of the Swordfish Rebuilding Alternatives
 - 7.6.3.1 Estimated Gross Revenues
 - 7.6.3.2 Estimated Net Revenues
 - 7.6.4 Economic Impacts of Shark Rebuilding Alternatives
 - 7.6.4.1 Present Value Analysis for Large Coastal Sharks
 - 7.6.4.2 Shark Angler Consumer Surplus
 - 7.6.5 Unavoidable Adverse Impacts
 - 7.6.6 Irreversible and Irretrievable Commitments of Resources
 - 7.6.7 Summary of Expected Changes in Net Benefits
- 7.7 Final Regulatory Flexibility Analysis
 - 7.7.1 RFA Requirements
 - 7.7.2 The NOAA Guidelines
 - 7.7.3 Description of Small Entities to which the Final Actions May Apply
 - 7.7.4 The Final Management Measures and Fishing Costs
 - 7.7.4.1 Financial Conditions of Different Fishing Sectors
 - 7.7.4.2 Costs Resulting from the Final Management Measures
 - 7.7.5 The Final Management Measures and Gross Revenues
 - 7.7.6 Minimizing Impacts on Small Entities
 - 7.7.7 Issues Raised During the Comment Period
 - 7.7.8 Conclusion

Chapter 8: Revised Final Environmental Impact Statement

- 8.1 Introduction
- 8.2 Purpose and Need for Action
 - 8.2.1 Problems for Resolution
 - 8.2.2 Management Objectives
- 8.3 Final Actions
- 8.4 Affected Environment

- 8.5 Environmental Consequences of Fisheries Actions: Effects of the Fishery on the Environment
- 8.6 Unavoidable Adverse Effects
- 8.7 Irreversible or Irrecoverable Commitment of Resources
- 8.8 Mitigating Measures
- 8.9 List of Preparers and Agencies Consulted

Chapter 9: Community Profiles of HMS Fisheries

- 9.1 Introduction to the Community Profiles
- 9.2 Methodology
- 9.3 Massachusetts Community Profiles
 - 9.3.1 Gloucester
 - 9.3.2 New Bedford
- 9.4 New Jersey Community Profiles
 - 9.4.1 Barnegat Light
 - 9.4.2 Brielle/Point Pleasant
- 9.5 North Carolina Community Profiles
 - 9.5.1 Hatteras
 - 9.5.2 Wanchese
- 9.6 Florida Community Profiles
 - 9.6.1 Islamorada
 - 9.6.2 Pompano Beach
 - 9.6.3 Madeira Beach
 - 9.6.4 Panama City
- 9.7 Louisiana Community Profiles
 - 9.7.1 Dulac
 - 9.7.2 Venice
- 9.8 Conclusion

Appendix I: HMS Advisory Panel Members

Appendix II: Selected ICCAT Management Recommendations and Year Adopted

Appendix III: 1999 General Category Effort Control Specifications for Atlantic Bluefin Tuna

Appendix IV: Atlantic Sharks: Executive Summary of the 1998 Shark Evaluation Workshop

Appendix V: Abbreviations and Acronyms Used in the HMS FMP

Appendix VI: Analyses of Options Considered for the Bluefin Tuna Time/Area Closure

Appendix VII: Bluefin Tuna Statistical Document

Appendix VIII: Comments and Responses

EXECUTIVE SUMMARY

This is the executive summary for the Fishery Management Plan (FMP) for Atlantic tuna, swordfish, and sharks, highly migratory species (HMS) that inhabit the Atlantic Ocean and adjacent waters. The HMS FMP replaces the existing Atlantic Shark and Atlantic Swordfish FMPs, and establishes an FMP for Atlantic tuna. Atlantic HMS are managed by the National Marine Fisheries Service (NMFS) under the authority of the Secretary of Commerce (Secretary), with consideration of the domestic and international aspects of these fisheries. This summary is only a summary of the regulations implemented in the HMS FMP. For a full description of the regulations implemented, please see the HMS FMP.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) is the primary domestic legislation governing management of the nation's marine fisheries. To date, Atlantic sharks and Atlantic swordfish have been managed under the authority of the Magnuson-Stevens Act by separate FMPs. This first FMP for Atlantic tuna will bring the management of tuna under the authority of the Magnuson-Stevens Act as well.

In 1996, the United States Congress reauthorized the Magnuson-Stevens Act. This reauthorization included a new emphasis on the precautionary approach in U.S. fishery management policy. New provisions of the Magnuson-Stevens Act require managers to halt overfishing; to rebuild overfished fisheries; to minimize bycatch and bycatch mortality, to the extent practicable; and to identify and protect essential fish habitat (EFH). These provisions are coupled with the recognition that management of HMS requires international cooperation and that rebuilding programs must reflect traditional participation in the fisheries by U.S. fishermen, relative to foreign fleets. Besides the Magnuson-Stevens Act, U.S. fisheries management must be consistent with the requirements of other regulations including the Marine Mammal Protection Act, the Endangered Species Act, the Migratory Bird Treaty Act, and several other Federal laws. These laws are described in Chapter 1 of this document. This FMP addresses these new requirements, as well as the requirements of other applicable legislation, and incorporates the best available scientific information into Atlantic HMS management.

Domestic management of these species presents several interesting challenges for fishery managers. First, several Atlantic HMS have been identified as "overfished" (west Atlantic bluefin tuna, Atlantic bigeye tuna, north Atlantic swordfish, and large coastal sharks). Although north Atlantic albacore was not listed by NMFS as overfished in the 1998 Report to Congress, this species meets the status determination criteria adopted in this FMP. Building and maintaining sustainable HMS fisheries is particularly challenging given the fact that many nations fish for these species. For most Atlantic HMS fisheries, the United States accounts for a fraction, and in several cases, a small fraction, of total fishing-related mortality of the species. Consistency in implementation and enforcement of conservation and management measures by all fishing nations is a significant concern that affects domestic HMS management and is considered in this FMP. Also, bycatch mortality of Atlantic HMS can further depress overfished stocks which slows rebuilding and represents an opportunity cost to users of the resource. Other issues under consideration are common to many fisheries: assuring optimal data collection and streamlining

and updating the management program. These management problems are addressed through a set of objectives for the FMP that can be found in Section 1.1.

In addition to domestic management concerns, HMS must to be managed in an international context. The International Commission for the Conservation of Atlantic Tunas (ICCAT) is the multi-national cooperative management body that provides scientific information and management recommendations for stocks of Atlantic tuna, swordfish, and billfish (billfish are managed under a separate FMP). In the United States, ICCAT recommendations are implemented under the authority of the Atlantic Tunas Convention Act (ATCA). At this time, no international management regimes currently exist for Atlantic sharks, although several international groups collect biological and trade data. In February, 1999, the United States was a leading participant in the Food and Agriculture Organization (FAO) Consultation on Shark Conservation and Management and successfully negotiated with the world's fishing nations on concrete steps to improve shark conservation in its Global Plan of Action. The Global Plan of Action builds upon the FAO Code of Conduct for Responsible Fisheries, encompasses all shark fisheries (both target and non-target), and specifies action on education of fishermen, exchange of information on shark fisheries and studies, assessments on levels of non-target catch of sharks, and assessments of the effectiveness of management measures.

Whenever possible, implementing regulations for this FMP are issued under the dual authority of the Magnuson-Stevens Act and ATCA. This FMP integrates management for the Atlantic tuna, swordfish, and shark fisheries, replacing the existing FMPs. This FMP was developed in coordination with Amendment 1 to the Atlantic Billfish FMP. Billfish (blue marlin, white marlin, longbill spearfish, and sailfish) are managed under a separate FMP, given the unique characteristics of the billfish fishery. It should be noted, however, that the strategies and objectives of the domestic billfish management program are similar to and consistent with those of this FMP. Indeed, several final actions in the billfish and HMS FMPs are complementary, particularly those addressing bycatch.

Development of this FMP began in September 1997 with the formation of the HMS Advisory Panel (AP). The HMS AP was established under a requirement of the Magnuson-Stevens Act, and is composed of representatives of the commercial and recreational fishing communities, conservation and academic organizations, the five regional fishery management councils involved in Atlantic HMS management, the Atlantic and Gulf coastal states, and the U.S. ICCAT Advisory Committee. Members of the HMS AP and their affiliations are listed in Appendix 1. The HMS AP met seven times during development of this FMP, including once during the public comment period on the draft FMP, and provided extensive guidance to NMFS. The FMP does not necessarily reflect all of the views expressed by the AP members; however, input from the advisory panels was extremely helpful in allowing NMFS to consider all aspects of the management issues. NMFS appreciates the contributions of each AP member to the HMS management process, and encourages fishery participants to communicate with AP representatives regarding issues of concern in their fisheries. All AP meetings are open to the public and NMFS holds AP meetings in communities throughout the HMS fishing region.

In October 1997, NMFS prepared and distributed a scoping document, *Issues and Options for Management of Atlantic Highly Migratory Species*, to serve as the starting point for

consideration of issues for this FMP. The scoping document described major issues in the fishery, legal requirements for management, and potential management measures that could be considered for adoption in the FMP. The scoping document was the subject of 21 public hearings that were held in October and November 1997 throughout the management area. The scoping meetings allowed NMFS to gather information from participants in the fisheries, and provided a mechanism by which the public could provide input to NMFS early in the FMP development process.

Following the scoping meetings, parts of the scoping document were reviewed several times by the HMS AP and interested members of the public. The issues and options in this scoping document were the first step in the preparation for the draft FMP. Early drafts of portions of the FMP that were considered by the HMS AP reflected new information in both the scientific (e.g., the June 1998 Shark Evaluation Workshop) and management (e.g., the final guidelines to implementation of the National Standards (NS) for fishery conservation and management) spheres. However, some of the latest information, such as the results of the September 1998 ICCAT stock assessment for bluefin tuna, was not available at the time of publication of the draft FMP. NMFS issued an addendum to the draft FMP in February 1999, which addresses the bluefin tuna rebuilding plan. New information on stock status and recovery trajectories that became available since the publication of the draft FMP or Addendum is considered in this final FMP.

In October 1998, NMFS announced in the *Federal Register* the availability of the draft FMP. The comment period on the draft FMP lasted from October 25, 1998, to March 12, 1999. The proposed rule that accompanied this draft FMP was published in the *Federal Register* on January 20, 1999. The supplemental part of this rule relating to the bluefin tuna rebuilding program was published in the *Federal Register* on February 25, 1999. The comment period on the proposed rule and the its supplement also went until March 12, 1999. Subsequent to the release of the proposed rule, NMFS held 27 public hearings in communities from Texas to Maine and the Caribbean. During the comment period, NMFS received several thousand comments from commercial and recreational fishermen, scientists, conservationists, and concerned individuals. An HMS AP meeting was held toward the end of the comment period to allow HMS AP members to view most of the comments NMFS had received on the draft FMP and accompanying proposed rule. NMFS considered comments from the public and the AP when preparing this final FMP. Changes to the preferred alternatives from the draft FMP are due, in large part, to the information and comments received, concerns raised during the public comment period, and other new information or analyses subsequent to the draft FMP.

The FMP incorporates all existing management measures for Atlantic tuna and north Atlantic swordfish that have been issued previously under the authority of the ATCA. It also incorporates all existing management measures for north Atlantic swordfish and Atlantic sharks that have been issued previously under the authority of the Magnuson-Stevens Act. Currently, south Atlantic swordfish and south Atlantic albacore tuna are managed only under ATCA; Atlantic sharks are managed only under the Magnuson-Stevens Act. Notable modifications or additions to the existing management program are discussed in this document. All existing management measures are retained under this FMP; modifications to some measures are explicitly discussed below. Should NMFS determine that further changes are necessary, they will be made through the FMP

amendment process or through rulemaking as described by the framework provisions (Section 3.10).

NMFS received considerable comment regarding the proposed time/area closure to protect small swordfish in the Florida Straits. Most comments indicated that this area was too small to be effective given the likely re-distribution of effort on the “fringes” of the closed area. NMFS has therefore, chosen to reconsider a more effective time/area closure to protect small swordfish and has begun the necessary biological, social, and economic analyses necessary for proposing a larger, more effective area or areas. In response to comments, and based on earlier analyses, the larger areas include the Charleston Bump and the Florida Keys. Analyses may also continue to examine areas in the Gulf of Mexico. NMFS will meet with the combined HMS and Billfish APs in the summer of 1999 to discuss the results of new analyses that NMFS is undertaking. After that discussion, NMFS will select a preferred alternative and publish a proposed rule under the framework of this FMP.

The FMP status determination criteria that allow managers to determine whether overfishing is occurring or a stock is overfished. The FMP also contains rebuilding programs for HMS that have been designated as “overfished.” Other measures implemented in the HMS FMP are listed below. Section numbers where the alternative can be found follow each preferred alternative in parentheses. This partial list of final management measures is followed by a set of tables that summarize current regulations. Tables 1 through 5 summarize the final actions by gear type. Tables 6 and 7 summarize final measures affecting shark fishermen. Table 8 summarizes final permitting and reporting requirements for HMS dealers. Table 9 summarizes which limited access permit qualifiers will receive and which limited access permit future participants will need to obtain. Table 10 summarizes the ecological, economic, and social impacts of each final action. Table 11 provides a list of abbreviations and acronyms used throughout the FMP; this list is also included in Appendix 5.

- Adopt quotas and time periods to rebuild Atlantic bluefin tuna, bigeye tuna, north Atlantic swordfish, and large coastal sharks stocks (3.4.1);
- Establish foundation for international development of quotas and time periods to support rebuilding of bigeye tuna and north Atlantic swordfish (3.4.1);
- Limit access to the commercial shark and swordfish fisheries; require both a shark and swordfish limited access permit to gain access to the commercial bigeye, albacore, yellowfin, and skipjack (BAYS) tuna pelagic longline fisheries (4.5 through 4.7);
- Implement observer coverage on all HMS charter/headboat vessels (3.8);
- Prohibit the use of pelagic driftnets in Atlantic tuna fisheries (3.4.3);
- Establish a “School Reserve” category in the bluefin tuna fishery (3.4.1);
- Change the fishing year for Atlantic tuna to June 1 through May 31 (3.4.4);
- Require the use of a vessel monitoring system (VMS) for all HMS pelagic longline vessels and require gear marking for all HMS commercial net and longline fisheries (3.5);

- Change the quota monitoring procedures for the Atlantic swordfish fishery including counting dead discards against the quota (subject to ICCAT adoption) and accounting for recreational fishing mortality (3.4.1);
- Require all vessel operators who must complete logbooks to complete and submit them within 48 hours of making a set but prior to offloading (3.8);
- Develop and implement a bycatch and bycatch mortality reduction outreach strategy for recreational HMS fishery participants (3.5);
- Allow retention of only those shark species known or expected to be able to withstand specified levels of fishing mortality (3.4.2);
- Change the system of opening and closing shark fisheries and make seasonal quota adjustments (3.4.1);
- Reduce the recreational retention limit for sharks to one shark per vessel per trip with a minimum size of 4.5 feet and establish an allowance of one Atlantic sharpnose shark per person per trip (no minimum size on Atlantic sharpnose sharks) (3.4.2);
- Require that all sharks harvested by recreational anglers have heads, tails, and fins attached (3.4.2);
- Create a new management unit of deepwater/other sharks and extend the anti-finning prohibition to this management unit (3.4.2);
- Count dead discards and state landings after federal closures against federal quotas for all sharks (3.4.1);
- Dissolve the Shark Operations Team (3.10);
- Change the quotas for pelagic and small coastal sharks and establish separate quotas for porbeagle and for blue sharks (3.4.1);
- Require all charterboat/headboat vessels to obtain an annual vessel permit and, if selected, to submit logbooks for all HMS trips (3.5);
- Require registration for all HMS tournaments (3.5); and
- Establish new permitting and reporting procedures for exempted fishing permits for sharks for the purposes of public display (3.8).

Table 1 What the Final HMS FMP means to pelagic and bottom longline fishermen.

Species	Landings Allowed	Permit Required	Reporting and Monitoring Required ¹	Annual Quota	Fishing Year ²	Minimum Size	Retention Limits
Swordfish	yes	yes; limited access permits for swordfish, sharks, tuna	Observer coverage and logbook	yes	June 1 - May 31	29" (73 cm) cleithrum to keel	15 swordfish per trip during closure of directed north Atlantic fishery. Incidental retention limits. ⁵
Bluefin Tuna (BFT)		yes-Atlantic tuna LL permit ³	Observer coverage and logbook, if selected; in addition, BFT must be tagged	yes	June 1 - May 31	73" curved fork length for sale	North of 34° N: 1 BFT not to exceed 2% of catch by weight South of 34° N: Jan 1 - April 30: 1 BFT with ≥1500 lb of other target species May 1-Dec. 31: 1 BFT with ≥3500 lb of other target species
Yellowfin Tuna (YFT); Bigeye Tuna (BET)		yes-Atlantic tuna LL permit, swordfish and shark limited access permits	Observer coverage and logbook	no	N/A	27" curved fork length	no
Albacore, Skipjack Tuna		yes-Atlantic tuna LL permit, swordfish and shark limited access permits	Observer coverage and logbook	no	N/A	no	no
Large Coastal Sharks		yes; limited access shark	Observer coverage and logbook	yes ³	Jan.1 to Dec. 31	Ridgebacks: 4.5 feet (137 cm) fork length	4,000 lb directed commercial retention limit; Incidental retention limits ⁴
Pelagic Sharks						no	No directed commercial retention limit; Incidental retention limits ⁴
Small Coastal Sharks						no	no
Deepwater and Other Sharks	yes	no	no	no		no	no
Prohibited Sharks ⁵	no	N/A	Observer coverage and logbook	no retention allowed		N/A	no retention allowed

¹Observer coverage and logbooks if selected; logbooks should be filled out within 48 hours of hauling set. In addition, VMS is required for pelagic longliners; Please contact NMFS before you purchase a vessel monitoring system to obtain the VMS specifications.

²NMFS will close a region in the mid-Atlantic to pelagic longline fishing in June to reduce dead discards of BFT.

³Dead discards and state landings after federal closures will be counted against federal quotas.

⁴For incidental limited access permit holders: 5 large coastal sharks per trip; a total of 16 pelagic or small coastal sharks (all species combined) per vessel per trip. Or 5 swordfish per trip for otter trawl, 2 swordfish per trip for all other gears.

⁵Prohibited for possession by pelagic and bottom longline fishermen: White marlin, blue marlin, sailfish, longbill spearfish, and the following sharks: sand tiger, bigeye sand tiger, whale, basking, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sevengill, sixgill, and bigeye sixgill sharks.

Table 2 What the Final HMS FMP means to recreational HMS fishermen.

Species	Landing s Allowed	Permit Required	Reporting Required	Annual Quota	Retention Limit	Fishing Year	Minimum Size
Swordfish	yes	no	Large Pelagics Survey (LPS) and Marine Recreational Fisheries Statistical Survey (MRFSS) only	subtracted from Incidental catch quota	no	June 1 to May 31	29" (73 cm) cleithrum to keel
Bluefin Tuna		yes ¹	LPS/MRFSS Tournament registration and reporting Call-in reporting 888-USA-TUNA ² NC tagging program	yes	variable throughout season ³	June 1 to May 31	27" curved fork length Size classes are defined in Chapter 2.
Yellowfin Tuna (YFT), Bigeye Tuna (BET)		yes ¹	LPS/MRFSS Tournament registration and reporting	no	3 YFT per person per day	June 1 to May 31	27" curved fork length
Albacore, Skipjack Tuna		yes ¹	LPS/MRFSS Tournament registration and reporting	no	no	June 1 to May 31	none
Large Coastal Sharks		no for private; yes for charterboat/headboat	LPS/MRFSS Tournament registration and reporting	no, see below ⁴	1 shark per vessel per trip (all species); allowance for 1 Atlantic sharpnose per person per trip.	January 1 to Dec. 31	4.5 feet fork length for all sharks except Atlantic sharpnose sharks
Pelagic Sharks							
Small Coastal Sharks							
Deepwater and Other Sharks		no	no	no	no		no
Prohibited Sharks ⁵	no	N/A	yes	no	no retention allowed		N/A

¹ To obtain an Atlantic Tuna permit, call 1-888-USA-TUNA or go to www.usatuna.com.

² NC anglers are exempt from reporting via 1-888-USA-TUNA because they must take all landed bluefin tuna to a reporting center to be tagged.

³ Anglers are advised to call 1-888-USA-TUNA to check retention limits before fishing.

⁴ Known sources of mortality to be included in establishing retention limits.

⁵ Sharks prohibited for possession by recreational fishermen include: sand tiger, bigeye sand tiger, whale, basking, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sevengill, sixgill, and bigeye sixgill shark.

Table 3 What the Final HMS FMP means to commercial harpoon fishermen.

Species	Landings Allowed	Permit Required	Reporting and Monitoring Required	Annual Quota	Retention Limit	Fishing Year	Minimum Size	Miscellaneous
North Atlantic Swordfish	yes	yes; limited access	Logbook, observer coverage (if selected)	yes: subtracted from Longline/Harpoon quota	none	June 1 - May 31	29" (73 cm) cleithrum to keel or 33 lb dw	Gear marking
Bluefin Tuna	yes	yes	Logbook, observer coverage	yes: Harpoon Category or General Category	Harpoon category: 73" to < 81": 1 fish per day ≥81": no limit General category: ≥73": 1 fish per day	June 1 - May 31	73" curved fork length	Gear marking

Table 4 What the Final HMS FMP means to purse seine fishermen.

Species	Landings Allowed	Permit Required	Reporting and Monitoring Required	Annual Quota	Retention Limit	Fishing Year	Minimum Size	Miscellaneous
Bluefin Tuna	yes	yes—limited to current vessels or their replacements	Observer coverage and logbook, if selected	yes; Individual Vessel Quota (IVQ)	<73": 1% per trip incidental take (no sale) deducted from IVQ ≥73" and <81": 15% per trip, 10% per year ≥81": No limit	For each vessel, August 15 to Dec. 31 or date when IVQ is filled	81" curved fork length, except for 15% per trip and 10% per year allowance for ≥73" and <81", and 1% incidental take <73" per trip	Incidental take allowed while fishing for YFT and skipjack
BAYS Tuna	yes	yes—limited to current vessels or their replacements	Observer coverage and logbook, if selected	no	none	June 1 - May 31	YFT, BET: 27" curved fork length. Skipjack, albacore: none	Season ends when BFT IVQ is filled

Table 5 What the Final HMS FMP means to commercial rod and reel/handline fishermen.

Species	Landings Allowed	Permit Required	Reporting and Monitoring Required	Annual Quota	Retention Limit	Fishing Year	Minimum Size	Miscellaneous
Bluefin Tuna	yes	yes	Observer coverage, logbook and LPS/MRFSS, if selected.	yes; General category	1 BFT per day	June 1 to May 31 or until quota is filled	73" curved fork length	Restricted Fishing Days (see Appendix 3)
Yellowfin Tuna; Bigeye Tuna		yes		no	no	June 1 to May 31	27" curved fork length	
Albacore, Skipjack Tuna		yes		no	no		none	
Swordfish		yes; limited access		yes	no		29" (73 cm) cleithrum to keel	Incidental retention limits ²
Large Coastal Sharks				yes ¹		Jan. 1 to June 30; July 1 to Dec. 31	Ridgebacks: 4.5 feet (137 cm) fork length	4,000 lb directed commercial retention limit; Incidental retention limits ²
Pelagic Sharks				yes ¹			none	No directed retention limit; Incidental retention limits ²
Small Coastal Sharks				yes ¹			none	No directed retention limit; Incidental retention limits ²
Prohibited Sharks ³		no	N/A	Logbook, observer coverage	no retention allowed		no retention allowed	N/A

¹Dead discards and state landings after federal closures will be counted against federal quotas.²For incidental limited access permit holders: 5 large coastal shark per trip; a total of 16 pelagic or small coastal sharks (all species combined) per vessel per trip. Or, for swordfish, 2 swordfish per trip.³Sharks prohibited for possession by recreational fishermen include: sand tiger, bigeye sand tiger, whale, basking, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sevengill, sixgill, and bigeye sixgill shark

Table 6 What the Final HMS FMP means to Atlantic shark fishermen.

The following sharks can not be kept commercially or recreationally: Whale, basking, sand tiger, bigeye sand tiger, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, longfin mako, bigeye thresher, sevengill, sixgill, bigeye sixgill, Caribbean sharpnose, smalltail, and Atlantic angel sharks.				
Management Unit	Species that can be retained	Quota (mt dw)	Size Limit	Authorized Gears
Large Coastal Sharks <ul style="list-style-type: none">- directed commercial retention limit of 4,000 lb dw per trip- incidental retention limit	<u>Ridgeback</u> : Sandbar, silky, tiger	622	4.5 feet (137 cm) fork length	LL; Gillnet (100% observer coverage required); Rod and reel; handline; bandit gear
	<u>Non-ridgeback</u> : Blacktip, bull, spinner, lemon, nurse, smooth hammerhead, scalloped hammerhead, great hammerhead	196	None	
Pelagic Sharks <ul style="list-style-type: none">- no directed retention limit- incidental retention limit	Shortfin mako, thresher, oceanic whitetip	488	None	
	Porbeagle	92		
	Blue	273		
Small Coastal Sharks <ul style="list-style-type: none">- no directed retention limit- incidental retention limit	Atlantic sharpnose, blacknose, finetooth, bonnethead	359	None	
Deepwater and Other Sharks	Catsharks, dogfish sharks, sawsharks, smoothhound sharks	None	None	
<u>Additional remarks:</u> All sharks not retained must be released in a manner that ensures the maximum probability of survival No finning any sharks no matter what species Fishing seasons January 1to June 30; July 1to December 31 Season-specific quota overharvest and underharvest adjustments; no reopening that year Limited access; Exempted Fishing Permit (EFP) requirements Count dead discards against federal quotas; Count state landing after federal closure against federal quota For incidental limited access permit holders: 5 large coastal sharks per trip; a total of 16 pelagic or small coastal sharks (all species combined) per vessel per trip				
Management Unit	Species that can be kept	Retention Limit	Authorized Gear	
Large Coastal, Pelagic, and Small Coastal Sharks	LCS: Sandbar, silky, tiger, blacktip, bull, spinner, lemon, nurse, smooth hammerhead, scalloped hammerhead, great hammerhead Pelagic: shortfin mako, thresher, oceanic whiteip, porbeagle, blue SCS: Atlantic sharpnose, blacknose, finetooth, bonnethead	1 shark per vessel per trip (all species) with a 4.5 feet fork length minimum size; allowance for1 Atlantic sharpnose per person per trip (no minimum size)	Rod and reel; handline; bandit gear	
<u>Additional remarks:</u> Harvested sharks must have fins, head, and tail attached (can be bled and gutted if tail is still attached) No recreational limits on deepwater and other sharks.				

Table 7 What the Final HMS FMP means to shark gillnet fishermen.

Species	Landing s Allowed	Permit Required	Reporting and Monitoring Required	Annual Quota	Fishing Year	Minimum Size	Retention Limits
Large Coastal Sharks	yes	yes; limited access shark	100% observer coverage at all times; Use of gillnet gear in shark fishery is prohibited if a NMFS observer is not on board Logbook if selected ¹	yes ²	Jan.1 to Dec. 31	Ridgebacks: 4.5 feet (137 cm) fork length	4,000 lb directed commercial retention limit; Incidental retention limits ³
Pelagic Sharks						no	No directed commercial retention limit; Incidental retention limits ³
Small Coastal Sharks						no	No directed commercial retention limit; Incidental retention limits ³
Prohibited Sharks ⁴	no	N/A	yes	no		no	no retention allowed
Large Whale Take Reduction Plan Requirements ⁵							
Gear Marking	Observer Area		Restricted Area		Strikenet Provisions		Entanglements
Observer area: Nov 15 to Mar 31 Color codes: blue and green 4-inch marks placed within 6 inches of each other Marks must be within 2 feet of top of buoy and midway along length	Restricted area PLUS an additional area along the coast to 26°46.5' N (near West Palm Beach, FL) and extending out to 80°00' W		Area from 32°00" N (near Savannah, GA) south to 27°51' N (near Sebastian Inlet, FL) and extending from the shore eastward to 80°00' W		(A) nets must not set at night or when visibility is less than 500 yards (B) each set must be made under the observation of a spotter plane (C) nets must not be set within 3 nautical miles of a right, humpback, fin or minke whale (D) If a right, humpback, fin or minke whale moves within 3 nautical miles of the set gear, the gear must be removed immediately from the water		If any listed whale is taken in gear, the vessel operator must contact NMFS and cease all fishing activities immediately. Listed whales in the north Atlantic include: humpback, northern right, blue, fin, sperm, and sei.
	Nov 15 to Mar 31: no fishing with shark gillnet gear without an observer		Nov 15 to Mar 31: no fishing with shark gillnet gear, except for strikenets				
	All shark gillnet gear must be attached to the vessel at one end		All shark gillnet gear must be attached to the vessel at one end				

¹ Logbooks should be filled out within 48 hours of hauling set.

² Dead discards and state landings after federal closures will be counted against federal quotas.

³ For incidental limited access shark permit holders: 5 large coastal sharks per trip; a total of 16 pelagic or small coastal sharks (all species combined) per vessel per trip.

⁴ Possession of the following sharks is prohibited: sand tiger, bigeye sand tiger, whale, basking, white, dusky, night, bignose, Galapagos, Caribbean reef, narrowtooth, Caribbean sharpnose, smalltail, Atlantic angel, longfin mako, bigeye thresher, sevengill, sixgill, and bigeye sixgill sharks.

⁵ The final rule implementing the Large Whale Take Reduction Plan was published February 16, 1999 (64 FR 7529). Note there are inconsistencies between this rule, the final rule governing the List of Fisheries and Gear under the Magnuson-Stevens Act (64 FR 4030), and the proposed rule to implement the HMS FMP (64 FR 3154) regarding the authorization of strike nets in the shark drift gillnet fishery; NMFS will resolve these issues through future regulatory or other measures.

Table 8 What the Final HMS FMP means to HMS dealers.

Species	Permit required	Reporting	
		Purchases from U.S. fishery vessels	Imported Fish
Swordfish	yes, including importers	yes, if vessels are federally permitted	yes; Certificate of Eligibility
Bluefin Tuna	yes, including importers and exporters	yes, if vessels are federally permitted	yes; BluefinTuna Statistical Document (for exports as well)
Bigeye, Albacore, Yellowfin, Skipjack Tuna	yes	yes	No ATCA restrictions currently apply. NOAA Form 370 required in certain instances (see Final rule).
Sharks	yes	yes, if vessels are federally permitted	no

Table 9 What the Final HMS FMP means for initial limited access permit issuance.

If you qualify for ¹ :	You will ALSO be issued ² :	Rationale:
Swordfish Directed	Shark Incidental and Atlantic tuna longline	Directed swordfish trips regularly encounter sharks and BAYS tuna
Swordfish Incidental	Shark Incidental and Atlantic tuna longline	Significant overlap in swordfish, shark, and BAYS tuna fisheries
Shark Directed	--	Directed bottom longline shark trips do not regularly encounter swordfish or BAYS tuna, according to observer data
Shark Incidental	--	Some fisheries that encounter sharks incidentally to other operations do not encounter swordfish or BAYS tuna; fisheries that do should be covered under the swordfish and Atlantic tuna permits
If you already have:	You will ALSO be issued ² :	Rationale:
Atlantic tuna incidental	Swordfish Incidental and Shark Incidental	Directed BAYS tuna trips regularly encounter swordfish and sharks

¹ Refers to limited access permits issued by the HMS Division immediately upon implementation of the limited access regulations; standard permit renewals would still be handled through the Regional Administrators.

² After the initial issuance, fishermen wishing to enter these fisheries will be required to obtain these permits on their own.

Table 10 Summary of the biological, economic, and social impacts of the final actions in this FMP.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
<i>Atlantic Tuna</i>			
Adopt the ICCAT Bluefin Tuna Rebuilding Program (20 Years)	~20 years to rebuild to an MSY of 2,800 mt ww. Overall west Atlantic quota remains the same (2,500 mt ww TAC), but U.S. landing quota increases slightly to 2,413 mt ww (3% more than SQ) per year. Under different stock-recruitment model, the latest assessment indicates that recovery to one estimate of MSY (of 7,700 mt ww) is not possible under 2,500 mt ww TAC. Includes measures to alter the TAC, the MSY target, and/or the rebuilding period based on subsequent scientific advice.	Minimal impacts expected as quotas are the same or slightly higher than current quotas.	Minimal impacts expected as quotas are the same or slightly higher than current quotas.
Adopt status quo for bluefin tuna quota allocations with Purse Seine category cap of 250 mt ww	Very little impact on size selectivity of catch and rebuilding. Assuming status quo catch levels and size selectivity of catch, the latest SCRS assessment projects that there is a 50% chance that the BFT spawning stock biomass will increase to levels which could support an MSY of 2,800 mt ww in 20 years. Under different stock-recruitment model, the assessment indicates that recovery to one estimate of MSY (of 7,700 mt) is not possible under status quo (2,500 mt TAC) catch levels.	Landings, and potentially gross revenues, for the Purse Seine category are capped. Under the IVQ system, however, Purse Seine category participants are assured of their quota and revenues. Handgear categories could experience slight increase in revenues and/or Angler Consumer Surplus (ACS) due to Purse Seine cap.	Likely continued conflict between the recreational and commercial sectors of the BFT fishery and among commercial categories. Fewer destabilizing impacts on fishing communities are expected under this alternative than under the other domestic allocation alternatives considered.
Implement a time/area closure in NW Atlantic for pelagic longliners during June	Reduction of dead discards of BFT by approximately 55%. Possible change in size composition of swordfish catch, due to displacement of longline fleet. Displacement may also have an effect on interactions with marine mammals and other protected species (in analysis, the effects varied depending on year analyzed).	Not expected to have a significant impact on landings of target species such as swordfish, sharks and tuna other than bluefin tuna. Travel time, as well as costs for fuel, bait, and ice may increase.	Communities with seafood processors may be affected, but given short time span of closure, it is not expected to be significant.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Prohibit the use of pelagic driftnets in the Atlantic tuna fisheries.	Allowing expanded use of new gear type in a fully fished, or overfished, fishery is inconsistent with the precautionary approach and an ICCAT recommendation to limit effective fishing effort in the yellowfin tuna fishery. Bycatch reduction for unmarketable finfish and marine mammals. Could result in tuna discards from drift gillnet vessels directing effort on other species.	Reduces the chances of overcapitalizing in fully-fished (yellowfin tuna) and overfished (bigeye tuna) fisheries. Loss of income for vessels that are interested in catching tuna with driftnet. However, this is not a well-established fishery.	There are potential social costs of this alternative for the community of pelagic driftnet fishermen, though the costs are largely a foregone opportunity that has not been fully exploited to date. These social costs are offset by benefits to fishing communities of preventing expansion of a fishery directed on fully fished stocks and with potentially high bycatch rates.
Add “Effects on Rebuilding and Overfishing” as a bluefin tuna quota transfer criteria	Uses precautionary approach and could result in faster BFT rebuilding.	Could reduce transfers to the Angling category, thus reducing ACS for private recreational and charter/headboat vessels.	Positive impacts for bluefin tuna fishery participants and fishing communities of speeding rebuilding. Social costs of this alternative could be borne by Angling category participants, though these costs are not expected to be substantial or prolonged.
Keep status quo on bluefin tuna size limits	Minimal impacts expected.	Minimal impacts expected.	Minimal impacts expected.
Keep status quo on bluefin tuna angling category recreational retention limits	Minimal impacts expected.	The current system, which relies on inseason adjustments, is selected because the recreational quota is limited and catch rates and locations are highly variable.	Minimal impacts expected.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Establish the foundation for a 10-year international rebuilding program for bigeye tuna; adopt if recommended by ICCAT	SCRS has recommended a reduction of the Atlantic-wide landings to 1992 levels (~85,000 mt ww), approximately a 6% reduction from current landings, as well as a reduction in catch of juveniles in equatorial fisheries through limits on FADS. Allows for increased catch following rebuilding.	This would result in at least a 6% reduction in revenues for the commercial fishery for bigeye tuna, if a TAC is established at 1992 levels. Possible reduction in charterboat revenues and in angler consumer surplus for the recreational fishery.	Social impacts associated with a 6% reduction in landings could be negative in the short term.
No additional action on spotter plane (status quo) at this time. This issue may be addressed later under the framework provisions.	Minimal impact on stock rebuilding since whatever quota is in place would most likely be harvested with or without assistance from aircraft. Inconsistent with OY goal of providing reasonable fishing opportunities for the longest time.	Continued positive economic impacts for spotter pilots, as they receive a portion of the revenues generated from fishery. Continued potential higher gross revenues to the vessel operators who use aircraft assistance because, although operators lose some gross revenues to the plane, they may catch enough to offset this cost. Continued potential negative impacts on vessel operators who do not use aircraft assistance because the fishery may close more quickly than if aircraft are prohibited.	NMFS is studying the affect of spotter planes on communities.
Establish a “School Reserve” category	Positive impact from helping to prevent the United States from exceeding its quota of school BFT.	Minimal impacts expected.	
Status quo size limits for bigeye and yellowfin tuna	Minimal impacts expected.	Positive impact through discouraging targeting of small fish and through survival of released fish to reproductive age. However, could increase discards.	Some loss of revenue to commercial fishery associated with regulatory discards.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Establish a recreational retention limit of 3 yellowfin tuna/person/day.	Minimal ecological effect because LPS data indicate that current catch rates generally are within this limit. This alternative could prevent expansion of the recreational fishery for yellowfin tuna in expectation of effort shifts away from other HMS that are subject to more restrictive rebuilding measures. Responds to ICCAT recommendation to limit effort at 1996 levels.	Minimal social and economic effects because LPS data indicate that current catches generally are within this limit. Minimal social impacts expected, as most recreational trips land less than 3 yellowfin tuna per person. May have some negative impacts in areas where charter/headboats retain more than this limit.	
Fishing year begins June 1 and ends May 31 for tuna.	No ecological impacts expected because it would not necessarily change any times or areas where fish are caught.	Beneficial economic impacts for the recreational and commercial industries; this measure is expected to increase the predictability of fishery.	Beneficial social impacts; this measure is expected to allow fishery participants more time to plan their fishing activities.
<i>Atlantic Swordfish</i>			
Establish the foundation for an international rebuilding program for north Atlantic swordfish; adopt if recommended by ICCAT.	~10 years to rebuild to MSY with a reduction in Atlantic-wide quota to 8000 mt ww and U.S. quota to 2,320 mt ww per year, a reduction of ~27% from the status quo.	Some vessels that rely heavily on swordfish revenues would likely be forced to seek revenues in other fisheries or exit fishing altogether. However, this dislocation of effort would be far smaller than under either 3 or 6 year rebuilding.	Some negative social impacts for fishing communities and participants in the short term, though these costs are offset by achievement of long-term stability for the fishery and realization of conservation goals of this FMP.
Count dead discards against swordfish quota (subject to ICCAT adoption)	Reduces U.S. fishing, but not overfishing by other countries. Contributes to faster stock rebuilding and may encourage fishermen to reduce dead discards, thus protecting younger age classes of swordfish. In the long term, could provide an incentive to increase post-release survival.	Reduces ex-vessel gross revenues in 1999 by 11.9% (proportion of discards in 1997). If U.S. commercial fishermen are successful in reducing dead discards of swordfish, economic impacts would be mitigated. Recreational discards are unlikely to have any impacts on commercial fishermen until stock rebuilds and directed fishing effort increase catch and discards.	There could be negative social impacts of this alternative, distributed throughout the communities that target swordfish on the Atlantic and Gulf coasts and in the Caribbean. Social costs of this alternative may be necessary, however, to achieve the long-term conservation requirements and goals of the fishery as mandated by the Magnuson-Stevens Act.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Subtract recreational swordfish mortalities from the swordfish Incidental Landings Quota on an annual basis.	Contributes to rebuilding by keeping mortality levels consistent with SCRS recommended levels.	Lowers administrative costs because landings will be taken off the Incidental quota each year. Unlikely to have any impacts on commercial fishermen until stock rebuilds and directed recreational fishing effort expands. At that time, NMFS will pursue other options for allocation of recreational quota.	This alternative could have minimal short-term negative impacts, particularly for commercial swordfish vessels, with long-term positive impacts for stability of the commercial and recreational fisheries.
Keep the 33 lb dw minimum size limit for recreational and commercial fishermen.	Coupled with time/area closures, this alternative could reduce mortality on small size classes of swordfish.	Resulted in foregone ex-vessel revenues estimated in 1997 to be in excess of \$2.9 million.	Minimal social impacts due to requirement to discard undersized swordfish.
Keep status quo fishing year: June 1 to May 31 for swordfish.	Minimal impacts expected.	Minimal impacts expected.	Minimal impacts expected.
<i>Atlantic Sharks</i>			
Prohibit possession of uncommon and seriously depleted LCS (including dusky and night sharks) in addition to 5 currently prohibited species; allow retention of commonly-landed LCS, pelagic, and SCS; redefine management unit categories.	Would allow for faster rebuilding for dusky and night sharks if bycatch mortality is not large. For the other commonly-landed LCS and pelagic and SCS, sustainability of current fishing mortality is uncertain.	Possible reduced revenues and increased costs for commercial fishermen because dusky sharks are a relatively important commercial shark species. Minimal impacts for other LCS, pelagic, and SCS fisheries because only landings of uncommon species would be eliminated.	This alternative helps mitigate the most severe cuts necessitated by conservation objectives by allowing fishery participants continued access to that part of the resource that can sustain fishing pressure. This alternative is expected to have positive long-term social and community-level impacts by contributing to rebuilding.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Divide LCS into ridgeback (RB) and non-ridgeback (NRB) sharks; implement minimum size of 137 cm FL (4.5 feet) with no quota reduction for RB; reduce NRB quota to 218 mt dw per year. Note: these quota levels do not account for the public display quota.	Would rebuild LCS consistent with “zero plus one mean generation time” rebuilding period. Due to RB size-depth segregation, a minimum size will allow higher level of effective F while supporting stock growth to MSY levels. This alternative would result in an average of ~50% reduction in RB landings by number, although the magnitude of the reduction will vary regionally. No quota reduction is implemented for RB under this alternative. More efficient time to rebuilding due to species-specific management.	May increase fishing costs by forcing vessels offshore, however this may be offset by higher prices for larger fish. Safety concerns in NC winter fishery due to increased fishing activity offshore. This alternative may result in cessation of fishing activity by some participants.	Social and community level impacts of this alternative are expected to be substantial. Impacts could include reductions in revenue and employment, changes in fishing practices, and changes in the nature of the fishery. These adverse social impacts are necessary to achieve conservation objectives of this FMP and the Magnuson-Stevens Act, and are mitigated to the extent practicable in order to allow continued participation of all fishing communities.
4,000 lb dw per trip commercial retention limit for LCS (status quo).	No additional ecological impacts.	No additional economic impacts because fishermen are currently operating under this restriction. Could continue to mitigate derby fishing conditions, to a certain extent.	Will have the benefit of prolonging the season and lending some stability to the fishery.
Schedule fishery openings for specified periods; season-specific adjustments the following year; no reopening that season	No direct ecological impacts. Indirect impacts may be altered bycatch and bycatch mortality.	May reduce derby fishing conditions and increase stability and predictability of LCS fishery.	This alternative increases predictability for shark fishermen and dealers.
Establish a recreational retention limit of 1 shark/vessel/trip with a minimum size of 4.5 feet (any species) and establish a bag limit of 1 Atlantic sharpnose/ person/trip (no minimum size).	Size limit will reduce effective fishing mortality on most sensitive life stages/sizes. Sustainability of fishing mortality on Atlantic sharpnose sharks is unknown, but catch rates do not appear to be decreasing.	Minimal effect since most LCS trips are already at this lower catch rate. May decrease angler willingness to pay in directed pelagic, trophy, and tournament fisheries.	Likely to have notable social effects by shifting the character of the nearshore fishery to primarily catch-and-release.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Require that all sharks landed by recreational anglers have heads, tails, and fins attached.	No direct ecological impacts.	Minimal economic impacts. Anglers would still be able to bleed fish to prevent spoilage of meat.	This alternative would have minimal social impacts because it would not preclude anglers from bleeding sharks, and would support conservation objectives.
Season-specific quotas for commercial fishery; annual adjustments for recreational fishery	Would eliminate unchecked quota overharvests and deviations from the rebuilding schedule.	May redistribute fishing effort by accounting for over/underharvests in the same season the following year. May reduce incentive to delay reporting and may reduce perception of inequity between regions in allocation of quota.	This alternative should reduce or eliminate potential inequities between regions in the allocation of available quota.
Account for all sources of fishing mortality in setting quotas, including counting dead discards and state landings after federal closures against the federal quotas	Would result in faster rebuilding to MSY levels for LCS and maintenance of pelagics and SCS at OY levels. May increase regulatory discards if fishery closures are extended or the fisheries do not open.	Significant economic impacts as available quota may be substantially reduced. Depending on the degree of quota reductions, may put some fishermen out of business as fishery closures may be extended or the fisheries do not open. State landings of LCS after federal closures have ranged from 32 to 52% of the available LCS quota.	Substantial social impacts where dead discards or state landings after a federal closure comprise a large portion of the currently available quota. This will have the effect of increasing competition in the fishery, although it would also hasten rebuilding. Adverse social impacts of this alternative are unavoidable to achieve conservation objectives of the fishery and of the Magnuson-Stevens Act. Social concerns under this alternative could be mitigated by implementation of limited access.
No time/area closures (status quo)	No additional ecological impacts.	No additional economic impacts.	No additional social impacts.
Authorized gear includes rod and reel, handline, bandit gear, longline, gillnet.	No additional ecological impacts.	No additional economic impacts.	No additional social impacts.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Adopt the Large Whale Take Reduction Plan regulations under the Magnuson-Stevens Act	No additional ecological impacts.	No additional economic impacts.	No additional social impacts.
Require 100% observer coverage in shark gillnet fishery at all times; prohibit use of gillnets unless a NMFS-approved observer is on board	No direct ecological impacts. May reduce bycatch and bycatch mortality if use of the gear is reduced due to lack of observers.	Minor economic impacts unless use of the gear is reduced due to lack of observers. If observer coverage cannot be provided, may have significant economic and social impacts.	Social impacts of this alternative are expected to be minimal when observers can be provided by NMFS but could be adverse and substantial if observers cannot be provided.
Create a new management unit of deepwater and other sharks to extend prohibition on finning to all sharks.	Minimal ecological impacts of reducing waste of sharks outside the original management units.	May decrease revenues for fishermen who derive revenues from fins of sharks outside the original management units.	Minimal impact expected.
Establish separate public display quota of 60 mt ww; establish separate public display permitting and reporting system	Minimal ecological impacts of ensuring better compliance with authorized activities.	Minor adverse impacts of reducing RB and NRB quotas and positive impacts of decreasing administrative delays. Increasing enforcement capabilities.	This alternative would eliminate delays of the current system, with few other social impacts.
Dissolve OT as superseded by HMS AP	No direct ecological impacts.	No additional economic impacts. May decrease confidence in management process through loss of OT forum for scientific debate, but NMFS believes the HMS AP can provide such a forum.	No additional social impacts.
Establish separate quota for porbeagle sharks of 92 mt dw; reduce pelagic shark quota by 92 mt dw to 488 mt dw	May have variable ecological impacts depending on porbeagle stock status. May exceed NS 1 guidelines if porbeagle sharks are at OY levels or may contribute to stock declines if porbeagle sharks are below OY levels.	May have negative economic impacts to the extent that fishermen would not be able to expand their porbeagle shark operations.	May have negative social impacts to the extent that fishermen would not be able to expand their porbeagle shark operations.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Establish a separate landings and dead discard quota for blue sharks of 273 mt dw; reduce pelagic shark quota by overharvests in blue shark quota	Minor ecological impacts on blue shark stocks because most blue sharks are discarded alive. May contribute to blue shark maintenance by preventing directed fisheries from expanding. May increase regulatory discards of pelagic sharks if overharvests in the blue shark quota are large.	May have substantial economic impacts because blue shark dead discards may exceed the quota and reduce the pelagic shark quota. Depending on the magnitude of any reductions, derby fishing conditions may develop and regulatory discards may increase.	May have substantial social impacts because blue shark dead discards may exceed the quota and reduce the pelagic shark quota. Depending on the magnitude of any reductions, derby fishing conditions may develop.
Cap commercial quota of small coastal sharks at 10% higher than 1997 levels pending assessment	Minor ecological impacts as the SCS quota is not reduced.	May have negative economic impacts to the extent that fishermen would not be able to expand their operations above 1997 levels.	May have negative social impacts to the extent that fishermen would not be able to expand their SCS operations above 1997 levels.
<i>Gear modifications</i>			
Require the use of VMS on all pelagic longline vessels.	Would result in increased enforcement of the time/area closures. No impacts on protected species or other target or non-target finfish.	Would cost \$1,800 to 5,000 in capital costs unless the system was leased. Ongoing communication costs of \$2.50 to \$5/day could be increased by fisherman's desire to improve communications with land-based contacts or other vessels. Costs would be mitigated by delayed offloading benefits for all vessels and North/South Atlantic transit benefit for distant-water vessels.	Substantial one-time cost for pelagic longline vessel owners, though this cost may be offset by several social benefits including increased effectiveness in enforcing rebuilding-related regulations; increased human safety at sea; and increased communication with other vessels and shore.
Gear-marking requirements for pelagic longline vessels	Increases the effectiveness of time/area closures and furthers the goal of bycatch reduction	One-time expenditure for fishery with minimal social and economic impacts.	Minimal social costs, with benefits to the fleet and fishing communities of increasing the enforceability of rebuilding management measures.
Move after one entanglement with a protected species	An estimated 40% reduction in serious injury and incidental mortality of strategic stocks of marine mammals.	Minimal impact because many vessels already adhere to this practice.	Social impacts of this alternative are minimal, though the cost of doing business may increase for directed swordfish vessels.

Final Action	Ecological Impacts	Economic Impacts	Social Impacts
Limit the length of mainline of a pelagic longline to 24 nautical miles from Aug. 1 to Nov. 30 in the Mid-Atlantic Bight	May reduce takes of marine mammals by effectively decreasing number of hooks per set. However, the number of hooks may remain the same, thereby changing the fishing pattern of the gear (hooks closer together).	Difficult to enforce. May reduce gross revenues per pelagic longline set.	The social impacts of this alternative are minimal.
<i>Monitoring, Permitting, and Reporting</i>			
Implement voluntary education workshops for commercial fishermen to reduce bycatch and increase bycatch survival.	Reduces bycatch by demonstrating handling and release techniques; improves the accuracy of bycatch reporting to dockside and telephone surveyors.	Because workshops are voluntary, minimal economic impacts are expected.	Minimal social impacts expected.
Implement voluntary observer coverage of all HMS charter/headboat vessels; mandatory observer coverage in the BFT purse seine and harpoon fisheries.	Increases biological information about the composition and character of total catch (landed and discarded), enhancing the quality of stock assessments.	Cost to vessel operators associated with housing and feeding observers; cost to NMFS associated with training and employing observers.	Minimal social impacts expected.
Require tournament registration for all tuna, swordfish, and shark recreational tournaments	Facilitates collection of catch and bycatch information in certain times/areas to more accurately characterize bycatch in tournaments, which differ from non-tournament fishing patterns.	Information collection burden on those tournaments that target only tuna and sharks; tournaments that involve billfish are already subject to this reporting requirement.	Minimal social impacts expected.
Require vessel operators to complete logbook forms within 48 hours of hauling a longline set	Improves quality of data on discard rates by minimizing poor recollection that may be associated with delayed reporting on multi-day fishing trips.	Information collection burden would not increase since longline vessels are already required to submit logbooks; some additional inconvenience to operators by requiring more immediate completion of the form.	Minimal social impacts expected.

Table 11 List of Abbreviations and Acronyms used in the HMS FMP. This list is also provided in Appendix 5.

AA:	Assistant Administrator
ACCSP:	Atlantic Coastal Cooperative Statistics Program
ACS:	angler consumer surplus
ANPR:	advanced notice of proposed rulemaking
AOCTRP:	Atlantic Offshore Cetacean Take Reduction Plan
AOCTRT:	Atlantic Offshore Cetacean Take Reduction Team
AP:	advisory panel
ATCA:	Atlantic Tunas Convention Act
AZAA:	American Zoological and Aquarium Association
B:	biomass
BAYS:	bigeye, albacore, yellowfin, and skipjack tunas
BET:	bigeye tuna
BFT:	bluefin tuna
BSD:	Bluefin Statistical Document
BO:	Biological Opinion
BUM:	blue marlin
BWFA:	Blue Water Fishermen's Association
CFMC:	Caribbean Fishery Management Council
CFL:	curved fork length
CFR:	Code of Federal Regulations
CITES:	Convention on International Trade in Endangered Species
CK:	cleithrum to keel
COE:	certificate of eligibility
CPUE:	catch per unit effort
CTC:	Cooperative Tagging Center of NMFS, Southeast Fishery Science Center
CV:	coefficient of variation
DFO:	Department of Fisheries and Oceans, Canada
DNA:	deoxyribonucleic acid
DOC:	Department of Commerce
DPUE:	discards per unit effort
dw:	dressed weight
EEZ:	exclusive economic zone
EFH:	essential fish habitat
EFP:	exempted fishing permit
EIS:	environmental impact statement
ESA:	Endangered Species Act
FMR:	fishing mortality rate
FAA:	Federal Aviation Administration
FAD:	fish aggregating device
FAO:	Food and Agriculture Organization
FDA:	Food and Drug Administration

FEIS:	final environmental impact statement
FMP:	fishery management plan
FL:	fork length
FR:	<i>Federal Register</i>
FRFA:	final regulatory flexibility analysis
FTE:	full-time employee
GCTA:	General Category Tuna Association
GMFMC:	Gulf of Mexico Fishery Management Council
GOM:	Gulf of Mexico
GRT:	gross registered tonnage
GSAFDF:	Gulf and South Atlantic Fishery Development Foundation
GWT:	gross weight tons
HAPC:	habitat area of particular concern
HMS:	highly migratory species
HP:	horsepower
ICCAT:	International Commission for the Conservation of Atlantic Tunas
ILAP:	initial limited access permit
I/O Paper:	Issues/Options paper
IQ:	individual quota
IRFA:	initial regulatory flexibility analysis
ITQ:	individual transferable quota
IVQ:	individual vessel quota
k:	carrying capacity
LCS:	large coastal sharks
LAP:	limited access permit
LJFL:	lower jaw fork length
LL:	longline
LOA:	length overall
LPS:	Large Pelagic Survey
LWTRP:	Large Whale Take Reduction Plan
M:	natural mortality rate
MAB:	mid Atlantic bight
MAFMC:	Mid-Atlantic Fishery Management Council
MEY:	maximum economic yield
MFMT:	maximum fishing mortality threshold
MMPA:	Marine Mammal Protection Act
MRFSS:	Marine Recreational Fisheries Statistical Survey
MSC:	maximum sustainable catch
MSFCMA:	Magnuson-Stevens Fishery Conservation and Management Act
Magnuson-Stevens Act:	Magnuson-Stevens Fishery Conservation and Management Act
MSST:	minimum stock size threshold
MSY:	maximum sustainable yield
mt:	metric ton

N:	number
NAS:	National Academy of Sciences
NEC:	northeast coastal
NEFMC:	New England Fishery Management Council
NEFSC:	Northeast Fisheries Science Center, NMFS
NEPA:	National Environmental Protection Act
NERO:	Northeast Regional Office, NMFS
NMFS:	National Marine Fisheries Service
NOAA:	National Oceanic and Atmospheric Administration
NRB:	non-ridgeback large coastal shark
NRC:	National Research Council
NS:	national standard
NSG:	national standard guideline
NT:	net tonnage
OCR:	optical character recognition
OT:	Operations Team
OY:	optimum yield
PBR:	potential biological removal
PRA:	Paperwork Reduction Act
PS:	purse seine
PVA:	present value analysis
r:	intrinsic rate of increase
RB:	ridgeback large coastal shark
RFA:	Regulatory Flexibility Act
RFD:	restricted fishing days
RIR:	regulatory impact review
SAFE Report:	Stock Assessment and Fishery Evaluation Report
SAFMC:	South Atlantic Fishery Management Council
SAI:	sailfish
SBA:	United States Small Business Administration
SCRS:	Standing Committee on Science and Research
SCS:	small coastal shark
SEC:	southeast coastal
SEFSC:	Southeast Fisheries Science Center, NMFS
SERO:	Southeast Regional Office, NMFS
SEW:	Shark Evaluation Workshop
SPR:	spawning stock biomass per recruit
SSB:	spawning stock biomass
SUV:	submerged aquatic vegetation
TAC:	total allowable catch
TALFF:	total allowable level of foreign fishing
TL:	total length
TXPWS:	Texas Parks and Wildlife Recreational Fishing Survey

U.N.:	United Nations
USCG:	United States Coast Guard
VMS:	vessel monitoring system
VPA:	virtual population analysis
WHM:	white marlin
ww:	whole weight